LucasMilhaupt®
A Handy & Harman Company
Global Brazing Solutions®

Technical Data Sheet

HANDY ALUMIBRAZE® 302

PRODUCT DESCRIPTION

Handy Alumibraze is a mixture of powdered aluminum-silicon filler metal and dry flux for use in molten salt bath dip brazing. Before use, water is added to form a thick slurry or paste which is applied to the joint areas. Because Alumibraze paste adheres readily to the base metal, the need for costly preforms or shims is eliminated. Fillet size is easily controlled by the amount of paste applied. Filler metal positioning problems are greatly reduced since Alumibraze will remain in place on horizontal, vertical or overhead joints. It allows the pre-placement of specific amount of filler metal in any given area. Alumibraze paste is especially useful on irregular, complex shapes (Fig. 1). The flux portion of Alumibraze has a higher melting point than either the brazing alloy or the brazing salt, but it is soluble in the salt bath. While the parts are in the salt bath, the flux acts as a sponge, keeping the molten filler metal in place by preventing gravity run down. As the flux dissolved into the salt bath the molten alloy flows into the adjacent capillary spaces giving smooth uniform fillets (Fig. 2). The dissolved flux is perfectly compatible with the salt bath constituents.

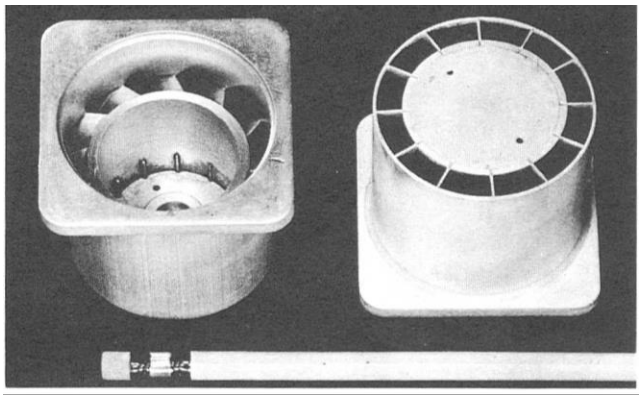

Figure 1

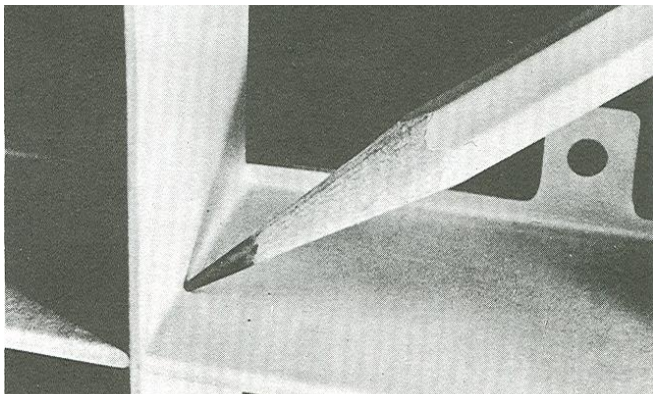

Figure 2

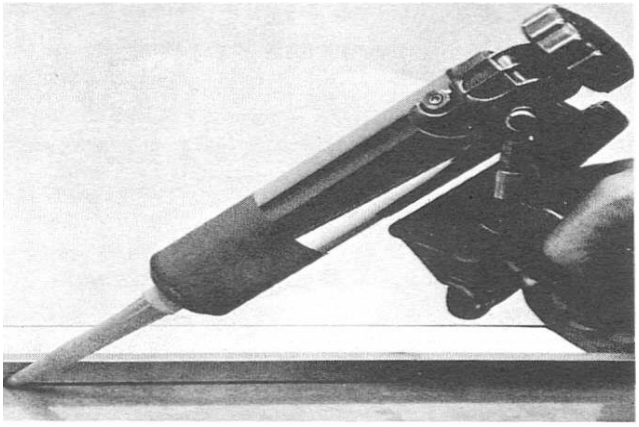

Figure 3

Lucas-Milhaupt, Inc. • 5656 S. Pennsylvania Ave • Cudahy, WI 53110 • Phone: 414.769.6000 • Fax: 414.769.1093 • www.lucasmilhaupt.com

NOMINAL COMPOSITION

Alloy

Aluminum	Remainder
Silicon	12.0% ± 1.0%
Copper	0.30% max
Magnesium	0.10% max
Iron	0.80% max
Zinc	0.20% max
Manganese	0.15% max
Other Elements (Each)	0.05% max
Other Elements (Total)	0.15% max

Alumibraze Powder

Alumibraze 302 has a nominal composition of approximately 9 parts powdered filler metal to 1 part of powdered flux. Alumibraze 302 produces a brushable consistency.

PHYSICAL PROPERTIES

Alloy	**Alumibraze 302**
Color	Grey
Melting Point (Solidus)	1070°F (577°C)
Flow Point (Liquidus)	1080°F (582°C)
Brazing Range	1080°F - 1120°F (582°C - 604°C)
Particle Size Distribution	-200 mesh

MIXING INSTRUCTIONS

While stirring, add enough water to Alumibraze 302 to form a thick paste or slurry. The consistency of the paste may vary to suit the application but three (3) parts de-ionized/distilled water to seven (7) parts powder by volume is a useful starting point. Uniform particle size assures equal dispersion of alloy and flux throughout the mixture. It is suggested that the product be mixed with water as needed and be used as soon as possible.

PRODUCT APPLICATION

Handy Alumibraze 302 is normally applied by manual methods using a small brush, spatula, eye dropper or tapered dowel. It is important for the paste deposit to have a broad contact with the joint area to reduce fall off during pre-heat or to prevent flaking off effect upon immersion in the salt bath. The following sketch illustrates (Figure 4) good and bad contact of the bead with the joint. As a general rule, the paste bead should not be thicker than about 0.25 in. An air supply of 10 lbs/in^2 (PSI) - 40 lbs/in^2 (PSI) is typically recommended but may be changed dependent on the orifice size required to operate the dispensing unit. The paste may be applied in a continuous bead or intermittently. It is advisable to apply paste to one side of a joint rather than to both sides since the latter may result in flux entrapment.

Lucas-Milhaupt, Inc. • 5656 S. Pennsylvania Ave • Cudahy, WI 53110 • Phone: 414.769.6000 • Fax: 414.769.1093 • www.lucasmilhaupt.com

PRODUCT APPLICATION

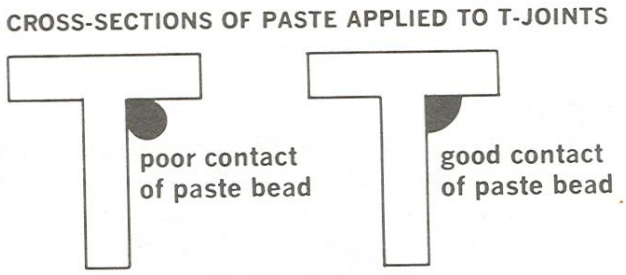

Figure 4

DESIGN & ASSEMBLY

When designing for brazing with Alumibraze, maximum joint strength will be obtained with lap, pierced or modified lap joints. Straight butt joints are least desirable and are to be avoided wherever possible. Joint clearances from 0.002 in. to 0.006 in. are best to enhance good capillary flow and maximum strength. Somewhat wider tolerances may be used under certain conditions. Avoid press fits. Burrs must be removed since they tend to cause skips in the brazed joints. All areas of the assembly must be accessible for degreasing and pre-braze chemical cleaning. The same general rule applies to fluxing. Design the brazed parts to allow molten salt penetration on both sides of the joints. If necessary provide holes to assure proper fluxing and drainage. Self-locating joints will lower fixture costs and assure better alignment of parts. Tack welding, spot welding, staking, self-locking seams or slots and tabs are frequently used to reduce the amount of fixturing. There are three factors to be considered where fixtures or jigs are required. The first is drainage which dictates simplicity of construction to permit complete drainage of the molten brazing salt from the assembly. Second is the corrosive action of the brazing salt on the jig material. Third is variation in the thermal expansion. The jig must allow for variations in thermal expansion between the aluminum and the fixture material. This is frequently done by spring loading. Stainless steels and Inconel alloys have proven most satisfactory as jig material. Inconel X-750 fixtures retain their temper best after continued use. Avoid using steel fixtures as they tend to contaminate the salt bath. To minimize distortion it is advisable to use aluminum in the annealed (or "0" temper) or in the T4 condition. Heat treatable alloys can be quenched immediately after removing from the salt bath, allowing time only for the filler metal to solidify. Constituents are thereby kept in solid solution. Artificial or natural aging can follow immediately. Aluminum alloys for dip brazing should have a melt range above 1050°F and a low percentage of iron and copper constituents. Some alloys frequently used are: 1100, 3003, 5050, 6061, 6063, 7005, Cast 443.0, Cast 406 and Cast A712.0.

PRECLEANING

Proper pre-cleaning is of prime importance. The braze filler metal will not flow over dirty or oxidized surfaces. Dirt and oil can be removed by an effective solvent or by vapor degreasing. Oxides should be removed chemically. A typical pre-braze cleaning procedure includes:

(1) Vapor Degrease
(2) Caustic dip (5% sodium hydroxide solution) for 2 minutes
(3) Water rinse
(4) Acid dip (30-40% nitric acid solution) for 30 seconds (use proper ventilation)
(5) Secondary rinse in hot water (160°F - 180°F) (limit to 3 minutes to prevent surface stains)

After cleaning, the parts should be brazed as soon as possible and always within 8 hours. The same procedure can be followed for post-braze cleaning. A final bright dip and rinse may be added if desired.

Lucas-Milhaupt, Inc. • 5656 S. Pennsylvania Ave • Cudahy, WI 53110 • Phone: 414.769.6000 • Fax: 414.769.1093 • www.lucasmilhaupt.com

BRAZING PROCEDURE

Following cleaning, apply Alumibraze 302 paste to the joint areas as outlined above. The actual brazing sequence consists of a preheat cycle immediately followed by immersion in the salt bath. The preheating insures the removal of all moisture and brings the whole assembly to a temperature high enough to avoid thermal shock to the molten salt bath. Both the braze assembly and fixture should be heated to 900-1075°F. The time required will vary depending on the mass of the parts and the amount of fixturing. However, keep the preheat time as short as possible, preferably under 15 minutes. Preheat furnaces should be electrically heated rather than gas fired. As soon as the part reaches the proper preheat temperature, remove it from the furnace and immediately immerse in the molten salt bath. Immersion time depends on the mass and configuration of the part but averages 30 seconds to 5 minutes. Brazing salt is corrosive and must be removed from the parts. The simplest method of removal is to quench the parts in warm water shortly after removal from the salt bath. The salt is water soluble. Salt baths operate at 1100°F. Components of the alloy flux are completely compatible with the brazing alloy and actually become a useful part of the salt bath. The brazing salt used in this process requires only the same periodic analyses and adjustments that are needed for conventional salt baths.

WARRANTY & STORAGE

Lucas-Milhaupt, Inc. warrants their Brazing and Soldering Paste products for 90 days from the date of shipment if stored in the original unopened container. Optimal storage conditions would be 65°F (18°C) - 75°F (24°C), clean and dry. It is recommended that the paste products are stored away from direct heat. Paste may require mixing to regain a homogenous mixture before application.

The 90 day warranty should not be interpreted as the shelf or useful life of the product. The paste products may be used well beyond the 90 day warranty, unless customer testing or production results indicate unsatisfactory performance of the product.

AVAILABLE FORMS

Alumibraze 302 is available in a variety of packaging options. Typically, the product is supplied in 5 lb. containers.

SPECIFICATIONS

Alumibraze 302 conforms to the following specifications (metal chemistry only):

- American Welding Society (AWS) A5.8/A5.8M BAlSi-4
- Aerospace Materials Specification (AMS) 4185
- Aluminum Association (AA) 4047

APPLICABLE PRODUCT CODE(S)

The applicable Lucas-Milhaupt product code(s) for this technical data sheet:

Handy Alumibraze 302: A00000753, Legacy Alloy 72-302

SAFETY INFORMATION

The operation and maintenance of brazing equipment or facility should conform to the provisions of American National Standard (ANSI) Z49.1, "Safety in Welding and Cutting". For more complete information refer to the Material Safety Data Sheet for Handy Alumibraze 302.

Lucas-Milhaupt, Inc. • 5656 S. Pennsylvania Ave • Cudahy, WI 53110 • Phone: 414.769.6000 • Fax: 414.769.1093 • www.lucasmilhaupt.com

WARRANTY CLAUSE

Lucas-Milhaupt, Inc. believes the information contained herein to be reliable. However, the information is given by Lucas-Milhaupt, Inc. without charge and the user shall use such information at its own discretion and risk. This information is provided on an "AS IS" AND "AS AVAILABLE" basis and Lucas-Milhaupt, Inc. specifically disclaims warranties of any kind, either express or implied, including, but not limited to, warranties of title or implied warranties of merchantability or fitness for a particular purpose. No oral advice or written or electronically delivered information given by Lucas-Milhaupt, Inc. or any of its officers, directors, employees, or agents shall create any warranty. Lucas-Milhaupt, Inc. assumes no responsibility for results obtained or damages incurred from the use of such information in whole or in part.

Lucas-Milhaupt, Inc. • 5656 S. Pennsylvania Ave • Cudahy, WI 53110 • Phone: 414.769.6000 • Fax: 414.769.1093 • www.lucasmilhaupt.com